

**Sm-Nd ISOTOP SYSTEM IN ALLENDE CAI's.** O.Bogdanovski and E.Jagoutz (Max-Planck-Institut fuer Chemie, Postfach 3060, D-55020, Mainz, Germany, e-mail: oleg@mpch-mainz.mpg.de).

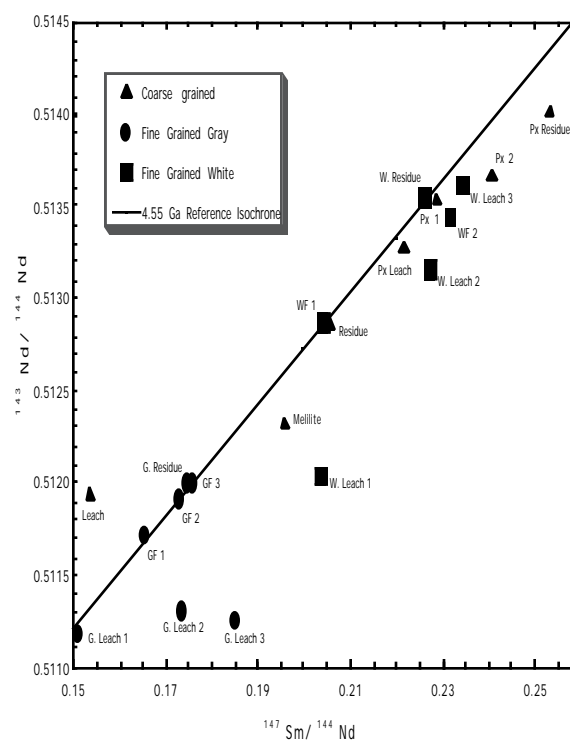
We studied the Sm-Nd isotopic system in CAI from Allende. Previous Sm-Nd chronological investigations of Allende inclusions were done by Scheinin [1] for coarse-grained inclusion (CW1) and by Papanastassiou et al. [2] for several large coarse-grained CAI's. For analyses two fine-grained (white and grey) and one coarse-grained inclusion have been taken. Inclusions have been carefully extracted from the internal part of the different Allende slices. All inclusions after extraction have been thoroughly washed with distilled ethanol. We made mineral separations from coarse-grained inclusion and partial dissolution on the fine-grained ones.

Coarse-grained inclusion after extraction and washing has been crashed in WC mortar and sifted into three fractions: fine- <50 mesh, middle - 50-100 mesh and coarse - >100 mesh. The fine fraction of this inclusion has been leached with 2.5 N HCl for 12 hours. About 50% of the sample were dissolved with this solution. From the fraction >100 mesh the pyroxene-separation was hand-picked, and also washed with 2.5 N HCl. In both cases residues after the leaching have been dissolved with the dissolution mixture (HF-HClO<sub>4</sub>). From the fraction 50-100 mesh we have separated by hand-picking two distinct phases: three pyroxenes and one melilite. Two of the pyroxenes were fine-grained and one was coarse. The coarse one was leached because it contained intergrowings of other minerals. One of the fine-grained pyroxenes was more dark then the other one. Melilite was existed only as a fine-grained, white mass.

Fine-grained inclusions (FGI) had irregular shapes, and different sizes; total masses of inclusions were ~207 mg for the grey inclusion and ~201 mg for the white one. Several fragments of different weight, have been chosen for Sm-Nd isotopic measurements. Three fragments of the grey inclusion (GF1, GF2 and GF3) and two fragments of the white one (WF1 and WF2) have been dissolved in the mixture of HF-HClO<sub>4</sub> and then passed through our regular chemical preparation procedure, described in Jagoutz et al. [3]. Since CAI's are very often strongly altered, we have used the leaching procedure for the fragments of both white and grey inclusions. We dissolved the samples in three different acids:

0.24 N HCl (Leach-1), 2.5 N HCl (Leach-2) and 16 N HNO<sub>3</sub> (Leach-3) for about 30 hours in closed beakers using an ultrasonic bath. The residue has been dissolved as usual with the mixture of HF-HClO<sub>4</sub> (Residue). In each dissolution step the samples have been weighted to check the loss of the weight of the fragment during dissolution. During selective dissolution for the white inclusion approximately 13% of the fragment was dissolved by leach 1, about 6% by leach-2, less then 0.5% by leach-3. In the residue were about 80% of the fragment mass. For the grey inclusion 32% of the fragment was found in the first leach, 7% in the second leach, >0.2% in leach-3 and 61% in the residue.

The results of our Sm-Nd measurements presented on Plot 1 along with the 4.55 Ga Reference isochron.



For fine-grained inclusions all the residue data points and data points of unleached fragments (except one) fall nearly on the 4.55 Ga Reference isochron, while the data points for

leaches are situated far away from this isochron. The leaches of grey FGI have the lowest measured  $^{143}\text{Nd}/^{144}\text{Nd}$  ratios and show large variance in Sm/Nd ratios. All three leach data points could be roughly fitted to a straight line. The leaches of white FGI demonstrated much wider dispersion of Sm/Nd and  $^{143}\text{Nd}/^{144}\text{Nd}$  ratios. These data points also lie on the straight line. Both these lines have no chronological sense, but definitely illustrate the alteration process of the CAI. The nature of this process is not clear but one can propose that it is a remobilization of the REE. Secondary phases, produced in this process, are easy-dissolvable phases and they are not predominant phases because the data points of unleached fragments of FGI shifted only very little from the Reference isochron. The residue data points are plotted on the Reference isochron. We should point also that one of the unleached fragments of the white inclusion fall on this "alteration" line. This fact indicates that the alteration process inhomogeneously effected inclusion.

For coarse-grained inclusion all data points are spread out along the Reference isochron. The fine fraction leach of this inclusion has the lowest  $^{147}\text{Sm}/^{144}\text{Nd}$  and  $^{143}\text{Nd}/^{144}\text{Nd}$  ratios. A respective residue data point for this sample lies on the Reference isochron. The highest measured values of  $^{147}\text{Sm}/^{144}\text{Nd}$  and  $^{143}\text{Nd}/^{144}\text{Nd}$  for this inclusion were obtained in the coarse pyroxene's residue.

All data points, except the fine fraction's leach and residue shifted from the 4.55 Ga Reference isochron to the side of higher Sm/Nd ratios (or lower  $^{143}\text{Nd}/^{144}\text{Nd}$  ratios). This is the only fine fraction leach to deviate in the opposite direction.

The fractionation of Sm/Nd ratios between melilite and pyroxenes is very large. The isochron through the data points of melilite, yields an age close to the 4.55 Ga but with an initial  $^{143}\text{Nd}/^{144}\text{Nd}$  ratio that is much lower than "chondritic" one. On the other hand if the melilite point is not taken into account, then we obtain an age about 4.2 Ga with an initial  $^{143}\text{Nd}/^{144}\text{Nd}$  ratio consistent with "chondritic" value. This age is similar to that obtained by Scheinin [1] for the Allende inclusion CW1. As was noted above, the melilite sample that we have analysed consisted of aggregates of fine intergrowings. Thus the isotopic analysis of a monomineralic melilite sample would help us in determining age because the intergranular space might contain secondary phases.

From the obtained data we can conclude that: 1) fine-grained inclusions affected by alteration processes that produce secondary mineral phases; 2) these processes do not significantly disturb the Sm-Nd isotopic system in the whole rock samples; 3) the residues of the fine-grained inclusions fall on the 4.55 Ga isochron.

References: [1] N.B.Scheinin, (1977), Ph.D. Thesis, UCSD; [2] D.A.Papanastassiou et al, (1987), LPSC XVIII, 760-761; [3] E.Jagoutz, (1988), GCA, 52, 1285-1293.